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ABSTRACT

Two way analyses of variance and cross-group descriptive comparisons assessed the effectiveness of the Siop Poison Prevention Program, which included an educational program and the use of warning labels, on improving verbal and visual discrimination of poisonous and nonpoisonous products for preschool children. The study sample consisted of 156 day care and nursery school children randomly assigned to one of four treatment groups: (1) educational program with Siop warning labels, (2) educational program, (3) Siop warning labels, and (4) control. A combination of the educational program with the use of Siop warning labels proved to be the most effective approach in both verbal and visual discrimination. The educational program proved more effective for verbal discrimination and the Siop warning labels proved more effective in improving visual discrimination. The results suggest two components for an effective poison prevention program: an intellectual awareness of poisons and an ability to visually discriminate poisonous from nonpoisonous products. The educational program tended to facilitate intellectual awareness more, while Siop warning labels had a greater effect on visual discrimination. (Author/MP)

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This study is part of an extensive research program examining the effectiveness of warning labels. Portions of this program have been reported at the APHA Convention held in Washington, D.C. in November of last year. However, the specific validation procedures included in this study have not been published.

ABSTRACT

Two way analyses of variance and cross-group discriptive comparisons assessed the effectiveness of the Siop Poison Prevention Program, which included an educational program and the use of warning labels, on improving verbal and visual discrimination of poisonous and nonpoisonous products for preschool children. The study sample consisted of 156 day care and nursery school children randomly assigned to one of four treatment groups: (1) educational program with Siop warning labels, (2) educational program, (3) Siop warning labels, and (4) control.

A combination of the educational program with the use of Siop warning labels proved to be the most effective approach in both verbal and visual discrimination. The educational program proved more effective for verbal discrimination and the Siop warning labels proved more effective in improving visual discrimination. The results suggest two components for an effective poison prevention program: an intellectual awareness of poisons and an ability to visually discriminate poisonous from nonpoisonous products. The educational program tended to facilitate intellectual awareness more, while Siop warning labels had a greater effect on visual discrimination.

VALIDATION OF A POISON PREVENTION PROGRAM

INTRODUCTION

The incidence of accidental poisonings in young children has become an increasingly serious problem. In 1974 the National Office of Vital Statistics tallied 135 deaths from accidental poisonings of children under five years of age.[1] For the period 1974 to 1976, a total of 10,077 hospitalizations for children under five years of age were reported to the National Clearinghouse and in 1974 a total of 3,921 hospitalizations for that year alone.[2] In 1975 poison centers in 44 states reported 102,709 cases involving children less than five years old.[3] Public health and medical authorities estimate that only one ingestion case in seven is recorded officially.[4] Last year (1977) an estimated 700,000 cases involving the accidental swallowing of dangerous substances took place in the United States.[4]

This data suggests that young children may have difficulty discriminating poisonous from nonpoisonous substances. Several approaches have been taken with regard to this problem, including attempts at educational programs and the design of warning labels.

A review of the literature failed to turn up any published poison prevention programs designed for young children. H. Breault developed an extensive adult educational program in poison prevention through local organizations in a small town, over a ten year period of time.[5] The program met with limited success, however,

with a 48% increase in accidental poisonings in young children during the time of the study.

The Poison Prevention Packaging Act of 1970, which requires potentially hazardous substances to use a "child resistant" cap or lid, represents another attempt to reduce accidental poisonings among young children.* Unfortunately, not all potentially poisonous substances are covered by the law and, as such, are not required to use the child resistant caps. As a result, many hazardous substance containers carry only written warnings which have no effect on children too young to read.

Another approach to the problem has been the development of new poison logos used as warning labels to replace the traditional skull and crossbones. Research conducted by the National Poison Center Network has shown the skull and crossbones to have little meaning for children today.[6] These findings led the National Poison Center Network to develop a new symbol called Mr. Yuk; a simple green circular face with a frowning mouth and protruding tongue. Another symbol based on the same findings was developed by the Rocky Mountain Poison Center, called Officer Ugg; a blue and green caricature of a policeman with his hands over his mouth. Studies are not available to determine the effectiveness of these symbols, but conclusions from a previous study examining characteristics of different logos suggested that both designs lack good discrimination qualities;

> When both logo stickers were given a simple test of being placed on bright bold labels of various household cleaner and medication containers, the two perspective images

*Public Law 91-601

were rather difficult to spot, Officer Ugg much more so than Mr. Yuk, which seemed to blend into the design of the containers.*

An approach that seems promising has been developed by the Brokaw Hospital Poison Control Center in Normal, Illinois. This approach includes an educational program designed to help young children better understand the concept of poison and to increase their discrimination between harmful and nonharmful products. One of the basic elements of the program is an empirically researched logo designed as a warning label to be placed on poisonous product containers to function as a deterrent.

PURPOSE

The purpose of this study was to determine the effectiveness of the educational program and the Siop warning label in improving discrimination between poisonous and nonpoisonous product containers. The study provided empirical data in answering the following questions:

Question 1. Do young children have difficulty discriminating poisonous from nonpoisonous products?

Question 2. Is the educational program effective in improving discrimination of poisonous and nonpoisonous products?

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*Taradejna, B., "The Development of a Poison Logo for Brokaw Hospital", Illinois State University, unpublished Master's Thesis, 1975.

Question 3. Is the Siop warning label effective in improving discrimination of poisonous and nonpoisonous products?

Question 4. What is the relative effectiveness in improving discrimination of poisonous and nonpoisonous products among the following approaches: (1) a combination of the educational program with Siop warning label, (2) educational program, and (3) Siop warning label?

Question 5. Is there a difference between the effects on verbal and visual discrimination?

METHOD

Subjects

The sample consisted of 156 three and four year old children (70 male, 86 female) enrolled in eight day care centers and nursery schools who volunteered to participate in this study. Subjects were randomly assigned to one of the following groups:

Educational program with Siop warning label - Children were exposed to the educational program and posttested with Siop warning labels attached to all the poisonous product containers.

Educational program - Children were exposed to the educational program and posttested without Siop warning labels.

Siop warning label - Children were not exposed to the educational program and posttested with Siop warning labels attached to all the poisonous product containers.

Control - Children were not exposed to the educational program and posttested without Siop warning labels.

Materials

Educational Program. The ecucational program involved a three day presentation ranging from 15 to 30 minutes per day. Materials used during the program included: puppets, poisonous and

nonpoisonous household products, a bulletin board illustrating household products, flash cards, activity books, antidote charts, and Siop warning labels. Parent-Teacher guides were also available.*

Siop Warning Label. The Siop warning label (Figure 1) was designed using an empirical approach. The shape selected for the label was round based on data showing a circle to be the geometric shape most easily recognized by young children.[7] An attempt was made to select colors that would be both attractive to draw attention to, and repelling to indicate danger. The background color selected was orange, the color found most attractive to young children, with the imposed character (Siop) a bright green, which tends to repell children.[8] Particular shades of these colors were selected for their brightness and contrast and also because they were among those colors least used by manufacturers in their product labels.

Insert Figure 1 - Siop, Brokaw Hospital Poison Control Center, Normal, Illinois, 1975

The actual Logo design, a representative of a serpent, was chosen because of the near universal avoidance of snakes. The label was available in two sizes to accomodate different sized containers

* The complete lesson plan for the program may be obtained from Brokaw Hospital Poison Control Center, Normal, Illinois 61761

and attached by an orange colored band that wrapped around the cortainers.

Pretest. The pretest consisted of an 84 item questionnaire (Appendix A) which was divided into three sections. The first section gave the child an opportunity to express his/her concepts of poison and danger. Section two involved the child's verbal discrimination of poisonous and nonpoisonous items from an orally presented list. The list consisted of 40 items (20 poisonous and 20 nonpoisonous), selected on the basis of availability to the child in the home. The order of presentation of these items was randomly assigned. The third section dealt with the child's ability to visually discriminate poisonous and nonpoisonous items. Forty products (20 poisonous and 20 nonpoisonous) were selected on the basis of availability to the child in the home, toxicity, and similarity of containers to nonpoisonous products. The items to be shown were placed in a box convenient to the experimenter, but hidden from view of the child. Items were randomly selected from the box and individually shown to the child until a response was made, then placed back into the box.

Posttest. The posttest involved a readministration of the pretest. Section three was modified in two of the groups (educational program with Siop warning label and Siop warning label) by having Siop warning labels attached to the poisonous product containers during the posttest.

Procedures

At the beginning of the study, subjects in all four groups were administered the pretest individually. The educational program with Siop warning label group and the educational program group were then presented the educational program beginning three to seven days after the pretest. These two groups were then posttested two weeks after the program. The posttests were administered three weeks after the pretests for the groups not receiving the educational program.

Pretests and posttests were scored as follows: one point was given for each poisonous item identified correctly and one point was subtracted for each nonpoisonous item identified as a poison. Scores could range from a high score of +20 to a low score of -20.

Analysis of the Data

Two way analyses of variance were computed to determine the effect of the educational program and the Siop warning label on discrimination scores. Separate analyses were done for verbal and visual discrimination. Probability was set at the .05 level of significance. In addition, the effectiveness of each treatment group was graphically presented for comparative purposes.

RESULTS

Two Way Analyses of Variance

Two way analyses of variance were calculated on the pre-test-posttest difference scores to determine the effects of the educational program and the Siop warning label on children's discrimination of poisonous and nonpoisonous products. Tables 1 and 2 summarize the F ratios for verbal and visual discrimination, respectively.

Insert Table 1 - Summary of Two Way Analysis of Variance of Verbal Discrimination Scores

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Insert Table 2 - Summary of Two Way Analysis of Variance of Visual Discrimination Scores

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Use of the Siop warning label proved significant at the .05 level for verbal discrimination (F=5.15) and at the .001 level for the visual discrimination (F=43.04). The educational program showed significance at the .01 level for verbal discrimination (F=7.74) and at the .001 level for visual discrimination (F=31.20). There were no significant interaction effects between the educational program and the Siop warning label in either verbal or visual discrimination.

Comparison of Groups

Tables 3 and 4 illustrate the mean pretest and posttest discrimination scores and percent of poisonous products identified correctly for verbal and visual discrimination, respectively. Figures 2 and 3 graphically illustrate the pre-posttest increases in percent of poisonous products identified correclty for verbal and visual discrimination.

Insert Table 3 - Verbal Mean Discrimination Scores and Percent of Poisonous Products Identified Correctly Across the Pretest and Posttest Conditions

Insert Table 4 - Visual mean Discrimination Scores and Percent of Poisonous Products Identified Correctly Across the Pretest and Posttest Conditions

Insert Figure 2 - Percent of Poisonous Products Identified Correctly From Pretest to Posttest for Verbal Discrimination

Insert Figure 3 - Percent of Poisonous Products Identified Correctly From Pretest to Posttest for Visual Discrimination

DISCUSSION

The discussion will follow the format of answering and discussing the questions posed by the study.

Question 1. Do children have difficulty discriminating poisonous and nonpoisonous products?

The data suggests that young children to have difficulty discriminating poisonous from nonpoisonous products as evidenced by the pretest scores in both verbal and visual discrimination skills where 30% to 40% of the poisonous products were identified incorrectly (see Tables 3 and 4). This suggests two possible areas of concern. One is that preschool children may not be aware that certain products are dangerous or harmful. The verbal discrimination pretest which asked children whether something was "to eat" or "not to eat, to stay away from," reported scores ranging from 63% to 73% of the poisonous products identified correctly. For whatever reason, about a third of the poisonous items presented were not recognized as being potentially dangerous.

The other area of concern is that even if a child is aware that a product is harmful, he may not be able to recognize it as such when he sees it. In the visual discrimination task many poisonous products were mistakenly identified as acceptable products when the examiner asked the child what he/she thougnt the product was. It appears that the current approach to packaging and labeling products may not be sufficient for easy recognition by the preschool

child. It is felt that this lack of awareness coupled with an inability to distinguish poisonous product containers significantly contributes to the problem of accidental poisonings.

Questions 2 and 3 investigated the effectiveness of two approaches to improving discrimination of poisonous and nonpoisonous product containers. One approach was an educational program designed to provide information about poisons. The second approach was a warning label designed as a deterrent to young children.

Question 2. Is the educational program effective in improving discrimination of poisonous and nonpoisonous products?

Question 3. Is the Siop warning label effective in improving discrimination of poisonous and nonpoisonous products?

The data suggests that both approaches were effective in improving discrimination skills. Results from the two way analyses of variance (Tables 1 and 2) for the educational program showed significance at the .01 level for verbal discrimination and significance at the .001 level for visual discrimination. The data also suggests that the Siop warning label was an effective means of improving discrimination of poisonous and nonpoisonous product containers. Tables 1 and 2 show significance at the .05 level for verbal discrimination and at the .001 level for visual discrimination.

Questions 4 and 5 are interrelated and are discussed together.

Question 4. What is the relative effectiveness in improving dis-

crimination of poisonous and nonpoisonous products among the following approaches: (1) a combination of the educational program with the Siop warning label, (2) the educational program, and (3) the Siop warning label?

Question 5. Is there a difference between the effects on verbal and visual discrimination?

It was felt that there could be differences in children's ability to verbally discriminate between poisonous and nonpoisonous products, which might be described as their "awareness," and their ability to behaviorally differentiate them. For this reason, both verbal and visual discrimination were analyzed. This difference is graphically illustrated in the cross-group comparisons shown in Figures 2 and 3.

Under both verbal and visual discrimination tasks, the combined educational program with the Siop warning labels scored highest. However, the educational program alone was relatively more effective in the verbal discrimination task than in the visual. This may suggest that the educational program was effective in increasing the child's awareness of poison but may not have been as effective in improving visual discrimination. An educational program alone may not be particularly effective in improving a visual type of discrimination. On the other hand, the Siop warning label may not substantially effect the intellectual awareness of avoiding poisons, but have a dramatic effect on visual discrimination of actual containers.

CONCLUSIONS

The present study provided data to document that preschool children do have substantial difficulty discriminating poisonous from nonpoisonous products. The data suggests that two factors contribute to this difficulty. One stems from an incomplete or inadequate understanding of which items are poisonous and which are not; the other from an inability to visually differentiate poisonous from nonpoisonous products.

Of the approaches employed in this study, the educational program combined with the use of teh Siop warning labels showed the greatest gain between pretest and posttest discrimination scores. The educational program, by itself, seemed to have a comparatively bigger impact on the verbal discrimination task, while the Siop warning labels were more effective in the visual discrimination task. The verbal discrimination task more closely paralleled the cognitive or informational component. The visual discrimination task more closely resembled a child's ability to recognize poisonous products. It appears as if the educational program may improve the child's knowledge or understanding of what substances are harmful or poisonous but may not improve the ability to differentiate them in actual practice. On the other hand, the Siop warning labels provide a more immediate means of identifying poisonous products.

In terms of a poison prevention program for preschool child-

ren, an understanding of which things are poisonous and the ability to identify them as such would both be important. However, in terms of reducing accidental poisonings, the ability to recognize dangerous products is, perhaps, more essential.

In practice it may be that the optimum approach for helping children visually recognize poisonous products would be the use of a warning label such as Siop accompanied by some form of an educational program. This approach, while being the most effective, also requires the most effort and expense. In situations where an educational program, such as the one described in this study, is not feasible, the use of Siop warning labels by themselves could still have a significant effect on facilitating recognition of poisonous products.

The research reported here is not intended to represent the final word on poison prevention programs. As in most research, more questions or unresolved issues are uncovered than answered: If preschool children have difficulty recognizing poisonous products, what can be done to emphasize the danger? Are some poisonous products packaged to closely resemble attractive nonpoisonous products? Perhaps manufacturers should carefully consider the degree to which they contribute to the problem.

Questions also arise as to how a program involving warning labels might be implemented. If a warning label is to be used, should it be part of a manufacturer's label? If not, who should be responsible for providing the label? Should it be a mandatory

or voluntary program? If mandatory, how should it be carried out and supervised? What types of educational programs are the most effective? Who should present it - parents, hospital personnel, firemen, or policemen? How should it be presented?

Although this study dealt specifically with preschool aged children, it has been suggested that the use of Siop warning labels might prove effective in other populations. One such group might involve those with limited reading skills such as the mentally retarded or those not familiar with the language. The distinctiveness and visual qualities of the warning label might also prove beneficial to those with limited or impaired vision.

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APPENDIX A

QUESTIONNAIRE

ADMINISTRATOR'S INITIALS_____ CIRCLE ONE PRE-TEST POSTTEST

SUBJECT'S NAME_____ SCHOOL_____

AGE_____ DATE_____ TIME_____

(Introduce yourself to make child feel comfortable)

I'm going to ask you some questions and I'd like to have you answer them for me.

Do you understand? Y N NR

1. Have you ever heard the word "poison?" Y N NR
2. What do you think it means? _____
3. Have you ever heard the word "danger?" Y N NR
4. What do you think it means?_____

Now, I'm going to read to you a list of things that might be in your home, I want you to tell me if they are things to eat or things you should not eat, that you should stay away from. If they are things to eat, I want you to say "eat". If they are not things to eat, and you should stay away from them, I want you to say "stay away". (Along with the "eat" nod your head yes and with the "stay away" nod your head no).

Do you understand? Y N NR

(Start with these trial questions to determine understanding)

Is gasoline something to eat or stay away from? E SA NR

Are M & M's something to eat or stay away from? E SA NR

5.	Soup	E SA NR	23.	Mothballs	E SA NR
6.	Liniment (BenGay, Bactine)	E SA NR	24.	Insecticide (Raid)	E SA NR
			25.	Hamburger (McDonalds)	E SA NR
7.	Popcorn	E SA NR	26.	A cookie	E SA NR
8.	Hair spray	E SA NR	27.	Aspirin	E SA NR
9.	Toast	E SA NR	28.	Ketchup	E SA NR
10.	Fingernail Polish	E SA NR	29.	Crackers	E SA NR
11.	Paint	E SA NR	30.	Popcicles	E SA NR
12.	Cereal	E SA NR	31.	Oven cleaner	E SA NR
13.	Milk	E SA NR	32.	Detergent (Tide/Cheer)	E SA NR
14.	Doughnuts	E SA NR	33.	Soda Pop (Coke)	E SA NR
15.	Antifreeze (Prestone)	E SA NR	34.	Koolaide	E SA NR
			35.	Jello	E SA NR
16.	Ice cream	E SA NR	36.	Potato chips	E SA NR
17.	Candy	E SA NR	37.	Jam	E SA NR
18.	Fabric Softener (Downey)	E SA NR	38.	Peanut butter	E SA NR
			39.	Bleach (Clorox)	E SA NR
19.	Turpentine (Paint remover)	E SA NR	40.	Cake	E SA NR
			41.	Cough medicine	E SA NR
20.	Vitamins	E SA NR	42.	Glue	E SA NR
21.	Lighter Fluid	E SA NR	43.	Gasoline	E SA NR
22.	Disinfectant	E SA NR	44.	Plants	E SA NR

Now, I'm going to show you some things that you might find in your home, and I want you to tell me if they are things to eat or things you should not eat, that you should stay away from. If they are things to eat, I want you to say "eat"-- if they are not things to eat and you should stay away from, then, I want you to say "stay away" (along with the "eat" nod your head yes and with the "Stay away" nod your head no). Also ask "What do you think this is?"

Do you understand?

45. Aspirin (Bayer, 100 tablet plastic bottle)
46. Preserves (Smuckers, Peach Preserves 3409 Jar)
47. Lighter (Bic plastic throwaway)
48. Hair Setting Gel (Dippity-Do·Balsam Set 8 oz. jar)
49. Sleeping Pills Nervine, 30 capsule Shaped tablets, Bottle)
50. Deodorizer (Crystalized in plastic wrap)
51. Paint (Sherwin Williams 1 quart can)
52. Milk (One half gallon carton)
53. Canned Soda (Sugar Free 7-up, 12 oz. can)
54. Baby Food (Heinz Pears, 4½ oz jar)
55. Nail Polish Manella, 12 fl. oz.)
56. Lollipop (Flat to resemble #50)
57. Vitamins (Ultra-Med Children's Chewable, Fruit Flavored Multi Vitamins-100 tablets)
58. Floor Wax (Johnson Future Acrylic Floor Finish, 16 fl. oz.)
59. Epsom Salts (Quality Brand 4 lb. carton)
60. One-wipe waterless cream (4 oz carton)
61. Wyler's Lemonade Flavor Drink Mix (24 oz. can)
62. DelMonte Pudding (5 oz tin)
63. Clairol Wild Strawberry Sunshine Harvest Shampoo (8 fl. oz)
64. Aunt Jemima Syrup (12 fl. oz.)
65. Prestone (Radiator Anti-rust water pump Lubricant 12 fl. oz can)
66. Cottage Cheese (16 oz carton)
67. Bottled Soda (Faygo Wild Strawberry soda, 16 fl. oz bottle)
68. Cheese Spread (Nabisco Snack Mate 4 5/8 oz. can)
69. Corn Syrup (Karo Light Corn Syrup - 16 oz. bottle)
70. Sterno (Cooking fuel 2 5/8 oz can)
71. Cereal (Life Cereal - 15 oz box)
72. Tic Tac Candy (Mints ½ oz clear plastic container)
73. Nutmeg (Kroger ground nutmeg 1½ oz tin)
74. Steak sauce (A.1. Steak Sauce - 5 oz bottle)
75. Food coloring (1 oz red plastic bottle)
76. Plant food (Ortho House plant food 5 fl. oz., plastic bottle)
77. Chewing gum (candy coated Bits-of gum - cinnamon-apple flavored)
78. Toothpaste (Crest 3 oz tube)
79. Copper cleaner (Lemon Twinkle Copper Cleaner - 10 oz jar)
80. Detergent - (Trend detergent 13½ oz. box)
81. Bengay (Gel 1¼ oz. tube)
82. Pez Candy (Pez candy dispenser)
83. Cough Syrup (Pertussin Wild Berry Cough syrup 3 fl. oz.)
84. Oil (Doon ease)

TABLE 1 - Summary of Two Way Analysis of Variance of Verbal Discrimination Scores.

Source	SS		MS	F
SS Total	2452.02	155		
SS Within	2247.19	152	14.78	
Siop Label	76.15	1	76.15	5.15*
Ed. Program	114.54	1	114.54	7.74**
Siop Label x Ed. Program	14.14	1	14.14	.95

*$p \leq .05$

**$p \leq .01$

TABLE 2 - Summary of Two Way Analysis of Variance of Visual Discrimination Scores.

Source	SS	df	MS	F
SS Total	1768.84	155		
SS Within	1187.86	152	7.81	
Siop Label	336.16	1	336.16	43.04***
Ed. Program	243.74	1	243.74	31.20***
Siop Label x Ed. Program	4.05	1	4.05	.51

***$p \leq .001$

TABLE 3 - Verbal Mean Discrimination Scores and Percent of Poisonous Products Identified Correctly Across the Pretest and Posttest Conditions.

Groups	Pretest		Posttest	
	Mean	%	Mean	%
Ed. Program with Siop Label	12.54	62.7%	16.67	83.4%
Ed. Program	12.82	64.1%	16.00	80.0%
Siop Label	14.15	70.8%	14.59	73.0%
Control	14.54	72.7%	15.51	75.5%

TABLE 4 - Visual Mean Discrimination Scores and Percent of Poisonous Products Identified Correctly Across the Pretest and Posttest Conditions.

Groups	Pretest		Posttest	
	Mean	%	Mean	%
Ed. Program with Siop Label	11.90	59.5%	17.26	86.2%
Ed. Program	13.28	66.4%	15.00	75.0%
Siop Label	14.02	70.2%	15.95	79.8%
Control	12.92	64.6%	13.10	65.5%

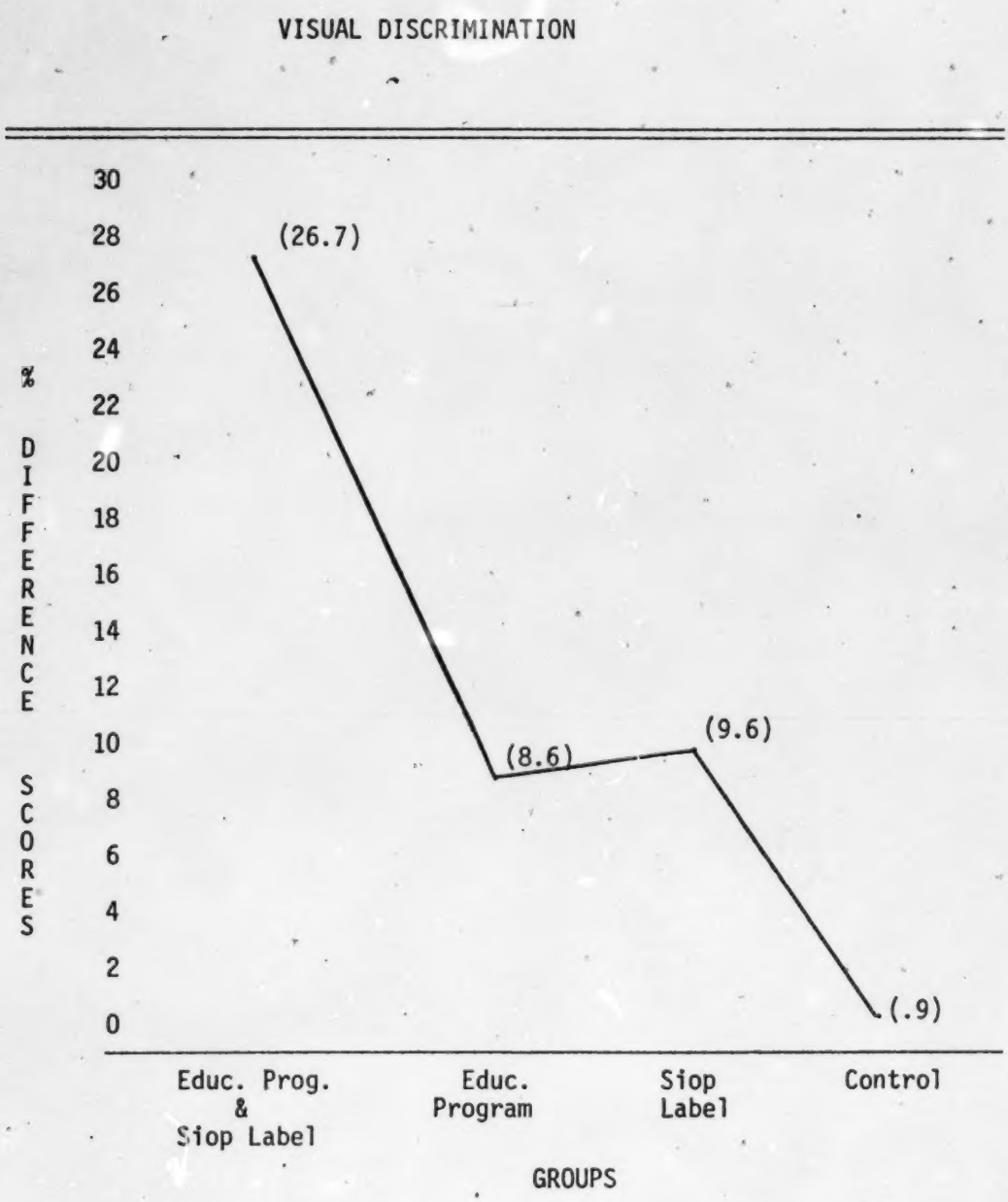

FIGURE 3 - PERCENT OF INCREASE OF POISONOUS PRODUCTS IDENTIFIED CORRECTLY FROM PRETEST TO POSTTEST FOR VISUAL DISCRIMINATION.

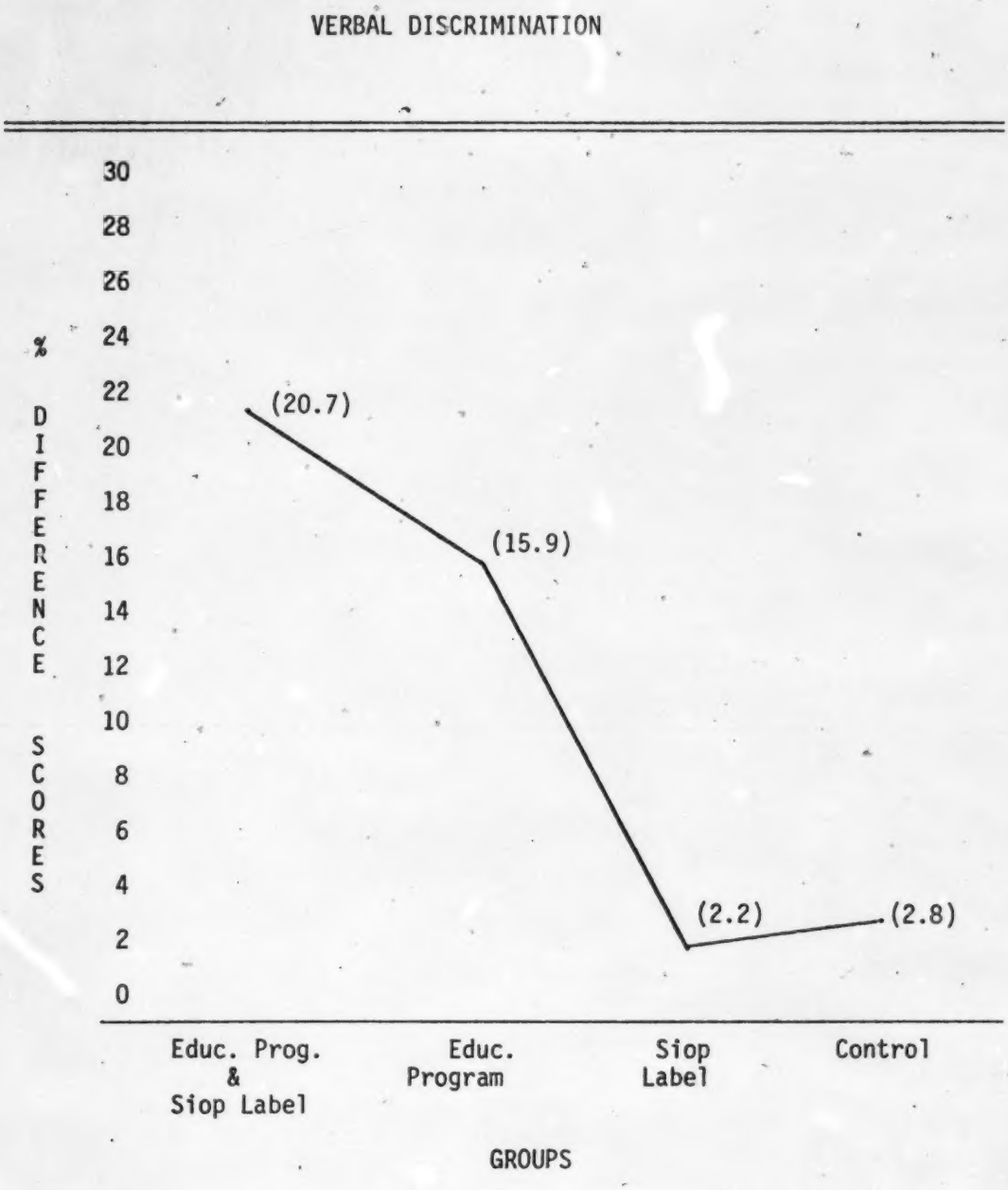

FIGURE 2 - PERCENT OF INCREASE OF POISONOUS PRODUCTS IDENTIFIED CORRECTLY FROM PRETEST TO POSTTEST FOR VERBAL DISCRIMINATION.